KEYNOTES

KEYNOTE I: Research-based active learning in physics as a model for progress in STEM education

Prof. Dr. David E. Meltzer, Arizona State University, USA, Associate Professor für Naturwissenschaften und Mathematik, David E. Meltzer received a doctorate in theoretical condensed matter physics from Stony Brook University in 1985, and later turned his focus to physics education research and research-based curriculum development. From 1998 to 2005 he was the director of the Iowa State University Physics Education Research Group. He later taught at the University of Washington in Seattle and joined the faculty at Arizona State University in 2008.

Physics education in the United States began in the 1800s and, even in those early years, instructional methods were developed and popularized that went far beyond the simple, traditional lecture format. Those methods, and the newer ones that evolved out of them over the years, have served as a model for improving instruction in other STEM fields such as chemistry, mathematics, engineering, biology, astronomy, and geosciences. In the 1880s, physics and chemistry educators both emphasized the need for students to make and interpret observations in the laboratory to help develop understanding of fundamental science concepts. In the 1960s, there was a renewed emphasis on guiding pre-university students in STEM fields to analyze experimental data and to engage actively in problem-solving activities. Beginning in the 1970s and continuing to the present, these ideas have been brought into university STEM instruction and developed further. It was recognized early on that, in order to be most effective, STEM instructors needed to have a deep understanding of students' science ideas, subject-specific learning difficulties, and reasoning processes; consequently, extensive research programs in teaching and learning were begun, initially in physics. Soon after, major research efforts began to develop in other areas of university STEM instruction. The instructional methods and materials that were developed have been called "research-based active learning"; they make use of insights about students' ideas and learning difficulties, gained through research, as a tool to guide the students in various problem-solving activities. Many assessments of student learning have demonstrated the effectiveness of these methods and materials. Students are encouraged to „figure things out for themselves" by engaging in a variety of problem-solving activities during class time, usually working together in small groups. Learning from peers is encouraged and instructors provide rapid feedback; students are guided to express and reflect on their own reasoning processes. By testing their ideas against those of student peers and data resulting from experiment, students are guided to improve their critical thinking abilities both in the subject-specific context, and beyond. These methods are broadly applicable to all STEM fields, and useful in diverse learning environments ranging from large lectures to small classes.

PROGRAMM

DONNERSTAG 21.09.2023	11:30 – 12:45	**Registrierung & Anmeldung**
	12:45 – 14:00	**Begrüßung** Prof. Dr. Christina Zitzmann, Vizepräsidentin für Bildung an der TH Nürnberg Prof. Dr. Claudia Schäfle, Wissenschaftliche Bereichsleiterin Lehr- und Lernforschung am BayZiel **Keynote I: Research-based active learning in physics as a model for progress in STEM education** Prof. Dr. David E. Meltzer, Associate Professor für Naturwissenschaften und Mathematik der Arizona State University

KEYNOTES

Mit den diesjährigen Keynotes richten wir unseren Fokus auf die vielfältigen Facetten der Lehr- und Lernforschung. Die renommierten ExpertInnen Prof. Dr. David E. Meltzer und Martina Mörth werden ihre wertvollen Erfahrungen und Erkenntnisse in einem inspirierenden Vortrag mit den Teilnehmenden des MINT Symposiums teilen. Ihre Keynotes dienen als Impulse, die nicht nur neue Perspektiven eröffnen, sondern auch zum tiefgründigen Nachdenken anregen sollen.